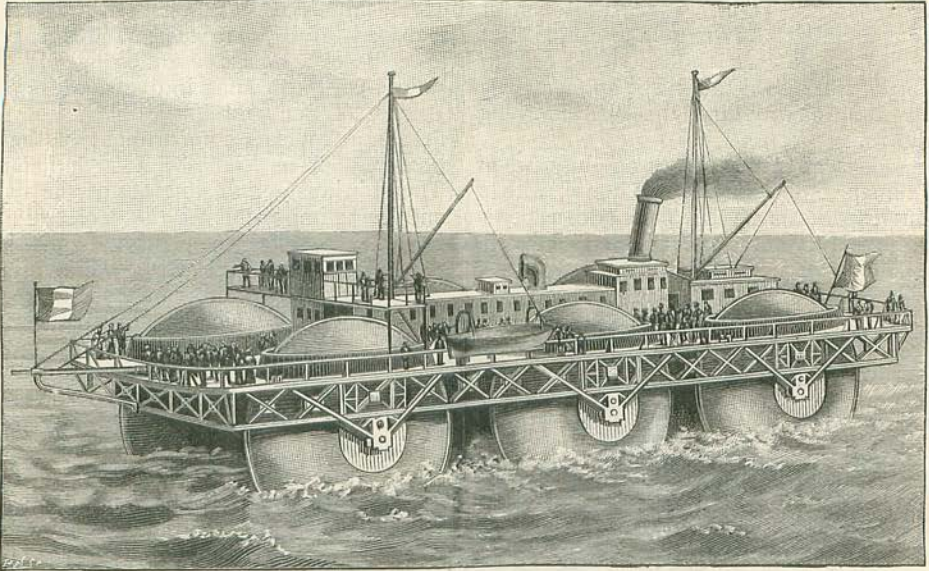


A Steamer on Wheels.

BY JAMES WALTER SMITH.



THE ROLLER-BOAT CROSSING THE CHANNEL.

BY squandering a few shillings you might fairly satisfy yourself whether M. Ernest Bazin, the French engineer, who has just constructed a packet on rollers, is a dreamer or a genius.

Two things are necessary for the experiment—a sizable tank of water, and a large tin button, or wheel, hollow inside, and sharp at the edge. The latter might cost two or three shillings to make. The water can be found in the family bath.

Now for the experiment. First put your wheel in the tank. It will float in an upright position, with about one-third of its bulk in the water. Now give it a sudden twirl with the fingers, and be careful not to push it forward. You will find that the wheel will continue to revolve for some time, and will remain in the same spot in the water. Now give the wheel a forward movement, but do not twirl it, and you will notice that, like the keel of an ordinary toy boat, it will toss the water in front and leave a wake behind. It will show no tendency to revolve, and will stop suddenly after it has advanced a short distance through the water. The next stage of the experiment will give you a shock of delighted surprise. By skilful manipulation, give to the wheel at one and the same time a

twirl and a push forward. The wheel will dash across the tank in the twinkling of an eye, and the water will remain almost unruffled.

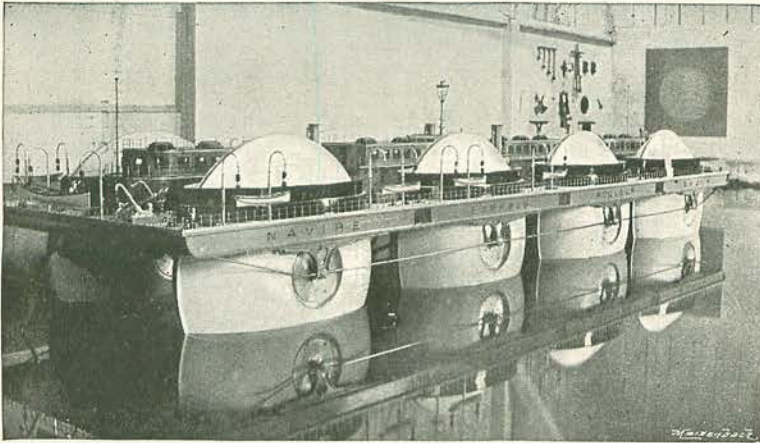
Some time ago, in a magnificent workshop in Levallois-Perret, a northern suburb of Paris, those simple experiments were performed by M. Ernest Bazin before a crowd of French engineering experts, and among them were numbered some of the most eminent admirals of the French navy. Naturally, there were scoffers in the lot, but it is said that these remained to pray—for the successful application to ocean navigation of a great principle involved in the simple manipulation of a hollow wheel upon water. The lesson which the experts drew from the experiments was the same lesson that M. Bazin had drawn years before when, after a long series of naval inventions, his attention had been turned to the problem of increased speed at the least cost upon the ocean. His experiments told him that for the propulsion of a boat on rollers, he could not depend simply on the revolution of the wheels, but would have to unite the revolving movement with a movement forward. The fact that the water remained undisturbed when he united the movements showed that, with a sharp-edged roller, the friction ordinarily met with in a

keel was reduced almost to a minimum ; and that as friction is one of the great hindrances to speed upon the ocean, there was a probability that a steamship constructed on wheels, and in accordance with the principles shown in the experiments, would revolutionize ocean navigation.

M. Bazin lately told me in Paris that if he had had enough money he would have constructed his ocean steamship outright. The enormous cost, however, of such an undertaking compelled him to be content with a model, and with the preliminary construction of a small roller-boat for the Channel service. The model was accordingly made, and from the photograph reproduced below one can see that it is a beautiful piece of work. It rests in a large tank at Levallois, and, in itself, it is a complete answer to the

with smooth surfaces. Such a form can offer but little resistance to the wind, while under the decks, which are to be constructed with powerful girders, the head winds will have an open passage. The formation of the decks in the model shows an enormous carrying capacity. This is naturally a desideratum, for in the fast ocean steamships of to-day very little freight is carried, on account of the space occupied by the fuel necessary for great speed. When the "liner" is built, M. Bazin hopes to show that he can attain a greater speed than is now attained, with a less expenditure of fuel, and that, in consequence, a great deal of the space occupied by coal will be given over to merchandise.

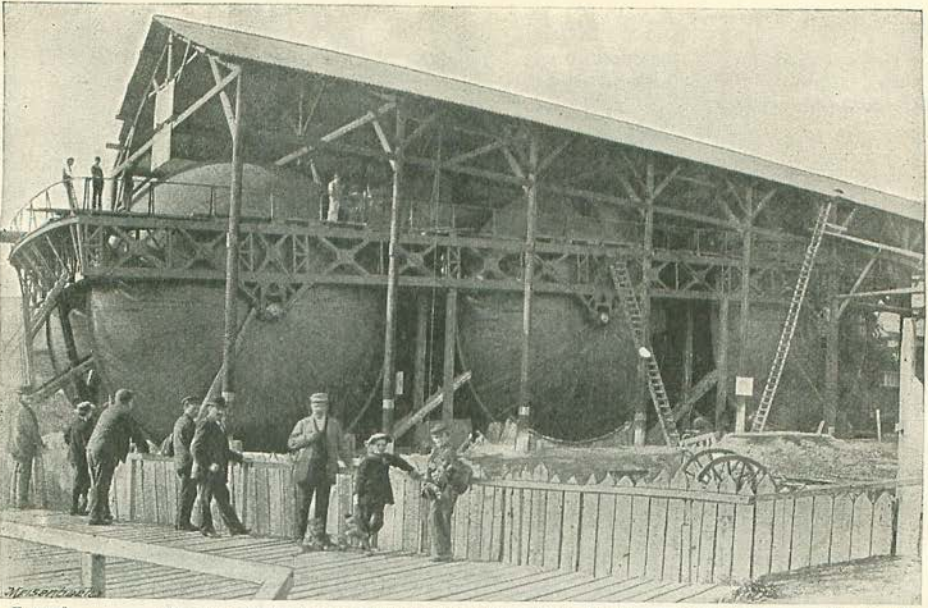
To the experts gathered round the tank at Levallois, the experiments with the single wheel were interesting, but the actual work-



MODEL OF TRANSATLANTIC STEAMSHIP, EXHIBITED IN A TANK AT LEVALLOIS, BY M. BAZIN.
From a Photograph.

often-made comment that a roller-boat *must* be an ugly and rickety contrivance. From the side of the tank, where one gets a complete view of the wheels, one is immediately struck with the oddity of its appearance, but a glance along the deck from the end of the boat shows little that is different from the deck of an Atlantic "liner." The front view, with the deck extending over the open water, reminds one of a New York ferry-boat, and the rollers are very similar to the paddle-wheel boxes of a penny steamer on the Thames. The state-rooms, bridge, and funnels enforce this similarity. The model is one-twenty-fifth the size of the projected "liner," which will be over 390ft. long. It shows eight wheels, four on each side, and, like the disc with which M. Bazin made his original experiments, they are convex in form

ing of the model gave rise to the highest hopes in the French breast. The motive-power was obtained from dynamos. One of these dynamos turned the screw or propeller, and gave the boat its forward motion; while four other dynamos, one to each pair of wheels, supplied the power to turn the wheels. When the power was turned on the screw began to move with rapidity, and the wheels moved slowly, but in a moment or two the boat began to move through the tank at surprising speed. Then, in order to exhibit the conduct of the model in rough weather, the water was stirred up until the waves reached the level of the deck. Yet the boat rode steadily, and showed that passengers would get little motion in a stormy sea. It may be said in passing that, when the "liner" is constructed, it will be without a



From a

THE ROLLER-BOAT JUST BEFORE LAUNCHING, AT ST. DENIS, ON THE SEINE.

[Photograph.]

rudder, and that the steering power will be given by a column of water ejected from the stern by means of a pump. By this means, the vessel, instead of being retarded by the resistance to an ordinary rudder, will be advantageously assisted by the water thrown out at the stern.

So much for the pretty model at Levallois. Not only on account of the cost, but owing to the fact that Paris is on a very narrow and shallow river, it was manifestly impossible for the inventor to construct at the French capital a trans-Atlantic steamer. It was, therefore, decided to build the smaller boat with six wheels, just large enough to go through the locks of the Seine, and at Rouen, where the river is wide and deep, and shipyards plentiful, to put in engines and heavy machinery, and prepare the boat finally for its maiden trip from Havre to London. It took some time at first to find an establishment in Paris where such a unique boat could be constructed with dispatch and with a willing co-operation between inventor and maker, but in the old establishment of Cail, on the banks of the Seine, at Saint-Denis, about five miles from Paris, the right place was found and work was begun.

While the myrmidons of the Cail Works are putting the inventor's idea into shape, and the enormous wheels in skeleton form are bringing the Parisians from far and wide to gaze at the shed and its cumbrous contents, let us turn for a moment to the inventor Bazin,

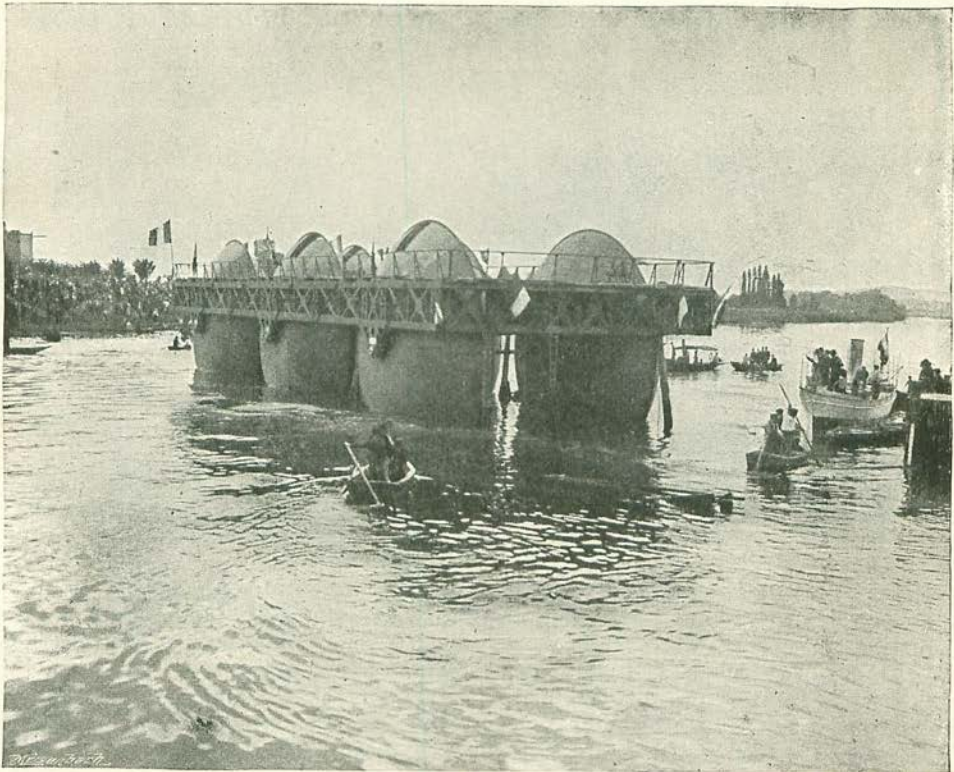
and see what manner of man he is. When I first met him in his home in the Rue Guillaume Tell, in Paris, I was surprised to find him, not a man of thirty or thirty-five—an age which, for some reason or other, we often attribute to inventors with great untried ideas—but a man of sixty or thereabouts, with iron-grey hair. But M. Bazin does not show his age; he talks with great rapidity, and moves as actively as a man of twenty. In face he is very like the late Napoleon, with a tuft of greyish beard on his chin, and a splendid forehead. Behind him the inventor has left a fine record, and around his rooms, which, at the time of my first visit, were strewn with newspaper clippings, piles of letters from all parts of the world, and magazines in all languages, regarding the "bateau rouleur," were pictures and mementos connected with the incidents of a long career in science. One of the pictures represents the Emperor Napoleon III. and the Empress visiting the works of the inventor, in 1866. Another represents MacMahon, at the Maritime Exposition of 1875, studying a curiously constructed boat exhibited by M. Bazin; and still another shows the King and Queen of the Belgians, at the Brussels Exposition of 1876, interrogating the inventor about his different works. In a far-off corner of one of the walls hung a long metal chain, which had been dredged out of the Neva by one of M. Bazin's dredgers, and above it was a photograph of the late Czar of Russia, who had sent the photograph

with the chain and his compliments. When I asked the inventor for permission to reproduce some of his mementos, he refused. "They are of no interest," he said, "and mean little except to me." Then, with great modesty, he added, "They are souvenirs of the past."

It would be impossible to catalogue all the notable inventions of this interesting "past." They are the direct result of a love for things maritime nurtured by a youthful study of science and a long service on the Indian Ocean. They include an apparatus for indicating the distance travelled by vessels, an hydraulic rudder, a submarine electric light, a dredging machine, a long-distance projectile, and a hydrostatic coffee-pot. The

of the world. It is the long record of success that has lent weight to the project of a roller-boat, and has drawn the experts to Levallois to see.

Let us now go back to the banks of the Seine to witness the launching of the *Ernest Bazin*—the name already given to this queer structure, which looks more like a gigantic plaything, or a Brobdingnagian trolley, than a plain, everyday steamboat. The inventor said it was like the bottom of a tram-car with a shed over it, and possibly this is the better simile. But photographs throw light on places which words weakly describe, and the accompanying illustrations will tell in a second just how the "roller-boat" looked "before and after" it felt the thrill of life along



From a Photo. by]

AFLOAT ON THE SEINE.

[H. Mairet, Paris

last two inventions on the list show that M. Bazin has not confined himself exclusively to inventions of a naval nature, but has touched upon all things. An ingenious machine for spinning hemp brought him years ago the Cross of the Legion of Honour, and the roller-steamship will probably put him among the Stephensons and Watts who have given spur to the progress

its six keels. For it is evident that each roller is a keel in itself. But the photographs give little idea of the immense crowd that lined the banks of Saint-Denis on August 19th—what a French writer has called "a red-letter day in the history of France." There were fully 20,000 people present at the launching, and among those were admirals and naval officers, and newspaper men in all

languages. The boat slid off the ways as easily as if it had had a year's practice, and, after a slight slump in the water, settled gracefully and successfully on the placid bosom of the Seine. Cries of "Vive le Bazin!" mingled with cries of "Vive la France!" and the few who expected the boat to sink or topple over reconsidered their arguments, and concluded that, after all, there might be something in those sharp and hollow wheels. The launching was the first real evidence that the boat was not a dream, and although one man said, "Wait until the trial trip!" the majority of spectators were fairly convinced that the outlook for ultimate success on the Channel was bright.

For some weeks after the launching, the roller-boat lay in front of the Cail Works in St. Denis. During this time, the flooring

machine of 550 horse-power, and each pair of wheels, as in the Levallois model, is rotated by an engine of 50 horse-power, making, for the three pairs, a force of 150. As may be seen from the end view, reproduced from the original drawing by M. Bazin, and lent to me by the *Revue Encyclopedique* of Paris, the rollers turn upon their own axes. The position of the screw is also shown, and the cross-section on the same page shows the position of the rudder, the arrangement of the machinery, the cabins, engine-room, and ventilators. The compactness of the total arrangement is striking, and nothing that experience has proved needful has been omitted in the construction.

When the news was first spread abroad that a boat on wheels had been successfully launched, there was great doubt as to



From a

THE ROLLER-BOAT IN FRONT OF THE CAIL WORKS AT ST. DENIS.

[Photograph.]

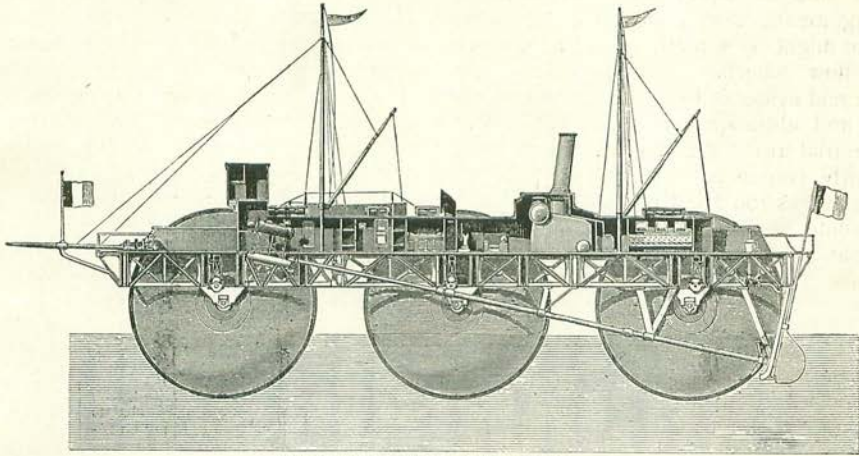
was laid across the iron deck-frame, the lighter machinery was put in place, and the interior of the rollers, which through the little openings at the top looked very like the interior frame-work of two big umbrellas, was firmly strengthened. About the middle of September the boat was towed to Rouen, where it was quickly changed in appearance from a mere platform on wheels into a most imposing craft.

For the benefit of those who understand things when they are expressed in cold numbers, a few facts may not be out of place. The platform is about 126ft. long and about 40ft. wide. Each wheel has a diameter of slightly over 32ft., and its greatest width is 10ft. The wheels are covered with plate about a quarter of an inch thick. The boat weighs 280 tons. The screw is moved by a

what "wheels" meant. Some said that they were little, and others said they were big. Some said that they were totally submerged; others that they rested on the water and skimmed along it; and still others imagined that the wheels were ordinary paddles. Any doubt as to their exact nature has, we may venture to say, already been cleared up by the photographs in this article. But the doubts regarding the feasibility of the invention are still many. Wouldn't the boat sink if struck? Wouldn't it toss wretchedly on the bosom of the deep? Wouldn't it this, and wouldn't it that? Well, a few trips on the Channel will be the best answer to those questions. But we may here recall the experiments made in the tank at Levallois. At that time, as we have said, M. Bazin, by stirring the water in

the tank, showed that the model would ride lightly on a turbulent sea. He also showed that the boat was practically unsinkable. He pulled out plugs in two of the wheels and the water rushed in immediately. When the water, moreover, had risen to a certain height in the roller, the wheel turned round and brought

arguments of M. Bazin, based upon practical experience, and put forth with a pleasing modesty, seem flawless. The inventor does not claim for the boat a medium speed of over eighteen knots, or more than twenty knots when the engines are pushed. Those who have studied the construction of the



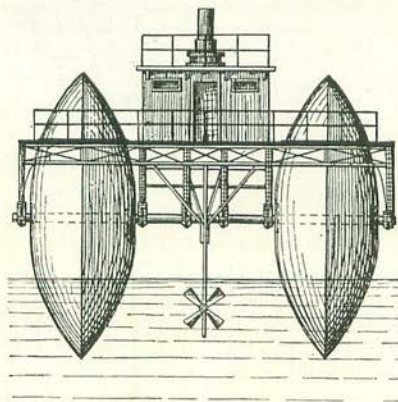
CROSS-SECTION OF THE ROLLER-BOAT.

the hole where the plug had been to the top. In case of an accident to one of the rollers, it would, therefore, be plainly possible to repair damages in a very convenient fashion. In order to make plain the more abstruse argument that there is little friction or resistance in a revolving wheel, M. Bazin placed two wooden sticks on the surface of the tank, and without turning the wheel gave it a forward movement against the obstruction. The bit of wood was forced back for a moment, but on account of the new friction, the wheel quickly stopped. The inventor revolved the wheel and sent it against the wood. The wheel passed over the obstruction, which sank in the water, passed under the wheel, and immediately returned to the surface, in almost the identical place. So far, indeed, as could be proved by the action of the model, every objection to the roller-boat was considered as satisfactorily answered.

It is, however, in the matter of speed that the boat may do wonders. Here, again, the

rollers, and who know a little navigation arithmetic, say that the boat will be capable of thirty-two knots. By means of several experiments with the model, the inventor obtained results which seem to show that the enthusiasts are correct in their belief. A cord attached to a framework on six wheels was passed over a pulley, carrying a weight of 200 grammes. The

boat was then put in position at the end of the tank, and was drawn forward by the gradual fall of the weight at the end of the cord. The passage across the tank occupied twenty-three seconds. Then, in addition to the propulsive movement given by the weight, the wheels were put into rotation by clock-work, and the boat went across the tank in eleven seconds. It has since been estimated—and for the moment a technical sentence is necessary—



END VIEW OF THE ROLLER-BOAT.
From a Drawing by M. Bazin.

the correct co-relation between the propelling and rotary forces is established, 60 per cent. of the movement in the wheel will be forward motion. Upon

this basis, Admiral Coulombeaud, a scientific authority of the highest importance, who has followed the theories and experiments of M. Bazin from the beginning, has stated that a boat with wheels 69·08 mètres in circumference, revolving at the rate of twenty-four revolutions per minute, would cover over thirty-two knots an hour; and in a hundred hours would cover more than the distance from Havre to New York.

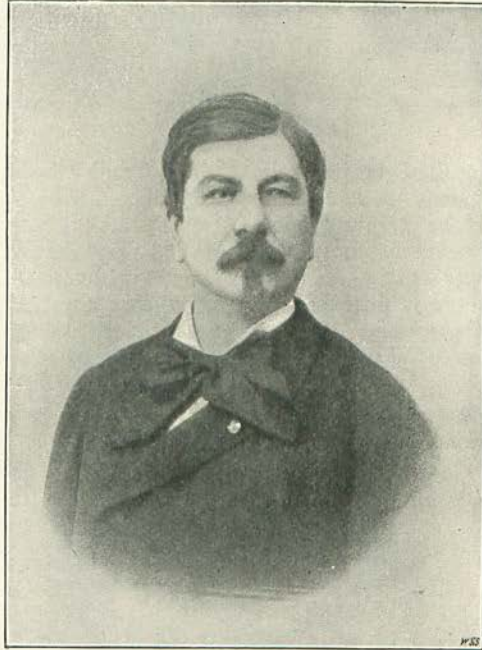
This, so far as it can be rid of technicalities and confusing numerical calculations, is the basis for the prophecy that we are on the eve of a great revolution in navigation. In 1895, the fleet *Lucania* crossed the Atlantic at the rate of 22 knots an hour, and her sister-ship, the *Campania*, has made 560 knots in one day. An average fast steamer rarely goes more than 20 knots an hour; although the Russian torpedo-boat destroyer *Sokol*, which is said to be the fastest steamer in the world, has made over 30 knots. But in the case of ocean liners such as are built to-day, a like speed will probably never be obtained. One authority has lately said that it costs thousands of pounds to add an extra half-knot on a fast steamer's speed, and that the limit has probably even now been reached. The power wasted in overcoming the friction and resistance of the water is enormous; and as the horse-power needful to force a ship through the seas increases tremendously with every knot sought for, it is little to be marvelled at that the "roller-boat," with its asserted economy and quickness, has caught the attention of the world.

The promises held out stir the mind and move the pen with enthusiasm. The prospect that the present voyage between Queens-town or Southampton and New York may be cut down to four, and, possibly, three and a-half days, makes the invalid on the ocean "liner" raise his head in prayerful thanks. The business man sees that the success of the invention puts him into communication with his customers more quickly than the merchants of Phœnicia could have dreamed. The steamship companies, looking at it from a food standpoint, see that the saving of a hundred hours from Havre to New York means the saving of tons of eatables, and, in consequence, increased dividends. The "globe-trotter" thrills with the idea that the records of Phineas Fogg and "Nellie Bly" will be extinguished, and that Puck's will be threatened. The hopes of all are rosy, but

in them there is a basis of practicality. Why should we not go faster? It is evolution.

For France, the result is all-important. While other nations have been making steady progress in the speed of their vessels, the country across the Channel has lagged behind. There are only two great steamship companies flying the French flag, and the best boats on these lines have reached their limit of speed in eighteen knots. Under these conditions, Frenchmen have lost hope in the struggle for commerce. The appearance of M. Bazin has revived the hope

that when the roller-boat takes its place in the Channel service, and the pretty model of the trans-Atlantic steamship becomes a reality, the supremacy in commerce will belong to France.



M. ERNEST BAZIN.
From a Photo. by Berger, Paris.